

The Limits of Monetary Policy Under Imperfect Knowledge^{*}

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1 Abstract

The modern theory of monetary policy emphasizes the management of expectations. In New Keynesian models frequently used for policy evaluation it is well understood that it is not so much the current interest rate, but instead anticipated movements in future interest rates that are central to aggregate demand management. Movements in current and future expected interest rates are linked through arbitrage relationships. Through the appropriate choice of current interest rates, good policy seeks to have these expectations evolve in a way that achieves the most desirable short-run trade-off between inflation and the output gap.

An important question then is whether the efficacy of monetary policy is compromised when current interest-rate movements are not efficiently transmitted to various longer-term interest rates relevant to spending and pricing plans of agents in the economy. Is the potency of monetary policy diminished when there is imprecise control of interest-rate expectations? That this is a relevant practical concern is well-captured by the following quote from Bernanke (2004):

“[...] most private-sector borrowing and investment decisions depend not on the funds rate but on longer-term yields, such as mortgage rates and corporate bond rates, and on the prices of long-lived assets, such as housing and equities. Moreover, the link between these longer-term yields and asset prices and the current setting of the federal funds rate can be quite loose at times.”

This paper builds a model of output and inflation determination in which a central bank can have loose control of interest-rate expectations relevant to spending plans. The source of imprecise control is imperfect knowledge: households and firms do not know the equilibrium mechanisms that determine prices and policy variables that are relevant for their economic decisions. In particular, in this paper we consider drifting beliefs about the long-run evolution of the economy. Households face uncertainty about their long-term income prospects (from wages and profits and real interest rates), while firms’ decisions depend on their assessment of long-run marginal costs and inflation. The focus on beliefs about the long-term is justified by a substantial literature pointing at the importance of slow-moving time varying drifts in explaining both economic data and survey-based measures of expectations. Several studies show that models with ‘shifting endpoints’ capture well both the dynamic properties of variables such as real GDP growth (Stock and Watson, 1989, Cogley and Sargent 2005 and Laubach and Williams 2003), the inflation rate (see Cogley, Primiceri and Sargent 2010), and

the federal funds rate (see Kozicki and Tinsley 2001 and Gurkaynak, Sack and Swanson 2005) as well as the slow movements of their consensus long-term expectations (see Edge, Laubach and Williams, 2007, Kozicki and Tinsley 2012 and Crump, Eusepi and Moench 2013).

In this context, it is shown that imperfect knowledge renders stabilization policy much more difficult. The analysis is performed in a standard New Keynesian model of the kind frequently used for monetary policy evaluation — see, for example, Clarida, Gali, and Gertler (1999) and Woodford (2003). Households and firms optimize their respective objective functions subject to constraints and have a completely specified belief system. In contrast to most papers in the literature, however, these agents have imperfect knowledge about the equilibrium mapping between observed state variables and market clearing prices. They approximate this mapping to forecast economy-wide variables relevant to their decision problems, such as prices and policy variables, by extrapolating from historical patterns in observed data. As a result, beliefs need not be consistent with the objective probabilities implied by the economic model. Beliefs are revised in response to new data using a constant-gain algorithm, which captures the perceived slow moving drift in the long-term evolution of the economy.¹ The size of the gain coefficient can be loosely thought of as indexing the degree of imperfect knowledge.

The central focus of this paper are the consequences of imperfect knowledge for monetary control. Under rational expectations, optimal policy prescribes that the nominal interest rate should track the evolution of the natural rate of interest, which in our framework embeds (exogenous) fluctuations in productivity, propensity to work and government spending. Importantly, optimal policy *under perfect knowledge* can fully stabilize output gap and inflation (the well known divine coincidence –see Clarida, Gali, and Gertler (1999)). The key result of the paper is that under imperfect knowledge and learning the efficacy of monetary policy can be drastically reduced. It is shown that imperfect knowledge prevents full stabilization of output gap and inflation, *even for optimal monetary policy that accounts for imperfect knowledge*. More precisely, a policy-maker who knows the structure of the economy and has full information about private agents' expectations formation process will not be able to achieve full economic stability. Optimal monetary policy has the property that the evolution of beliefs is managed in exactly the right way to ensure a bounded equilibrium consistent with maximization of households' welfare. In this sense the economy is stable: it has unique bounded state-contingent evolution for all endogenous variables given bounded stochastic disturbance processes. But this does not necessarily imply that drifting beliefs are not problematic for the

¹Milani (2007), and Eusepi and Preston (2011) provide empirical support for such belief structures.

transmission of monetary policy.

Under imperfect knowledge optimal policy prescribes slow adjustments in current interest-rate policy in response to evolving macroeconomic conditions to limit excess volatility in long-term rates. Changes in current interest rates lead to revisions of beliefs about future interest rates, albeit with a lag due to learning dynamics. The revisions in beliefs in turn feedback on the state of aggregate demand in subsequent periods. Aggressive adjustment of current interest rates, which would promote full stabilization under perfect knowledge, cause excessive movements in long-rates and macroeconomic volatility. Potential instability in long-term interest rates constrains the degree to which current monetary policy can respond to evolving economic conditions. In other words *the link between short-term interest setting, and the evolution of long-term interest rates is much weaker* under imperfect knowledge than under rational expectations.

The results in the paper have two main implications for current monetary policy debate. First, the past recession is widely believed to be caused by a ‘demand’ shock, lowering both the output-gap and inflation. However, despite the monetary stimulus provided by central banks in the form low interest rates from conventional and unconventional policies, the recovery in US and in other countries remains sluggish. Consequently monetary authorities have been criticized for ‘not doing enough’. This paper suggests that the observed gradual adjustment is not inconsistent with policy being set optimally once we take into account of market participants’ uncertainty about economic fundamentals. Second, the paper offers an alternative rationale for gradualism in monetary policy even in normal times, as reflected by high interest smoothing coefficients that are usually found in estimated Taylor rules.

References

- CLARIDA, R., J. GALL, AND M. GERTLER (1999): “The Science of Monetary Policy: A New Keynesian Perspective,” *Journal of Economic Literature*, 37, 1661–1707.
- EUSEPI, S., AND B. PRESTON (2011): “Expectations, Learning and Business Cycle Fluctuations,” *American Economic Review*, 101(6), 2844–2872.
- MILANI, F. (2007): “Expectations, Learning and Macroeconomic Persistence,” *Journal of Monetary Economics*, 54, 2065–2082.

WOODFORD, M. (2003): *Interest and Prices: Foundations of a Theory of Monetary Policy*.
Princeton University Press.